Claims

I claim:

1. A gas transfer system comprising:

a reservoir having liquid therein;

a reactor;

a liquid inlet connected to the reactor for feeding a liquid from the reservoir into the reactor;

a gas inlet feed connected to the reactor for feeding a gas into the reactor;

an outlet connected to the reactor for transferring the liquid having at least some of the gas dissolved therein from the reactor to the reservoir;

a first feed pump operatively connected to the fluid inlet for pressurizing the liquid inlet feed and the reactor;

a second feed pump operatively to the fluid inlet for further pressurizing the liquid inlet feed and the reactor;

a regenerative turbine operatively connected to the outlet; and

a rotatable shaft, the shaft connecting the first feed pump and the regenerative turbine and serving to operate both the first feed pump and the regenerative turbine.

2. The gas transfer system of claim 1, wherein the first feed pump comprises an axial flow pump.

3. The gas transfer system of claim 1, wherein the first feed pump comprises a centrifugal pump.

4. The gas transfer system of claim 1, wherein the second feed pump comprises an axial flow pump.

5. The gas transfer system of claim 1, wherein the second feed pump comprises a centrifugal pump.

6. The gas transfer system of claim 1, wherein the regenerative turbine comprises a Kaplan turbine.

7. The gas transfer system of claim 1, wherein the regenerative turbine comprises a centrifugal pump.

8. The gas transfer system of claim 1, wherein the reactor comprises an aerator, the liquid comprises water, and the gas comprises oxygen.

9. A gas transfer system comprising:

a first reservoir having liquid therein;

a second reservoir;

a reactor;

a liquid inlet connected to the reactor for feeding a liquid from the first reservoir into the reactor;

a gas inlet feed connected to the reactor for feeding a gas into the reactor;

an outlet connected to the reactor for transferring the liquid having at least some of the gas dissolved therein from the reactor to the second reservoir;

a first feed pump operatively connected to the fluid inlet for pressurizing the liquid inlet feed and the reactor;

a second feed pump operatively to the fluid inlet for further pressurizing the liquid inlet feed and the reactor;

a regenerative turbine operatively connected to the outlet; and

a rotatable shaft, the shaft connecting the first feed pump and the regenerative turbine and serving to operate both the first feed pump and the regenerative turbine.

10. The gas transfer system of claim 9, wherein the second reservoir contains a liquid, the liquid having a low level of dissolved gas therein such that the discharge of the liquid having at least some of the gas dissolved therein from the reactor into the second reservoir minimizes the effervescent loss of dissolved gas.

11. The gas transfer system of claim 10, wherein the reactor comprises an aerator, the liquid comprises water, and the gas comprises oxygen such that the method results in dissolving oxygen into the water.

12. The gas transfer device of 10, wherein the fluid inlet comprises a first end and a second end, and wherein the first feed pump is operatively connected to the first end of the fluid inlet and the second feed pump is operatively connected to the second end of the fluid inlet.

13. The gas transfer device of claim 10 wherein the fluid inlet comprises a first inlet tube and a second tube connected by a header, and wherein the first feed pump is operatively connected to the first inlet tube and the second feed pump is operatively connected to the second inlet tube.

14. A method of gas transfer comprising the steps of:

providing a gas transfer system according to claim 1;

feeding the gas into the reactor via the gas inlet feed;

operating the first feed pump and the second feed pump to feed the liquid from the reservoir into the reactor via the liquid inlet;

operating the first feed pump, the second feed pump and the regenerative turbine to pressurize the gas and the liquid housed in the reactor;

dissolving at least some of the gas into liquid in the reactor; and

transferring the liquid having at least some of the gas dissolved therein from the reactor to the reservoir via the outlet.

15. The method of claim 14 wherein the gas comprises oxygen and the liquid comprises water such that the method results in dissolving oxygen into the water.

16. A method of gas transfer comprising the steps of:

providing a gas transfer system according to claim 9;

feeding the gas into the reactor via the gas inlet feed;

operating the first feed pump and the second feed pump to feed the liquid from the first reservoir into the reactor via the liquid inlet;

operating the first feed pump, second feed pump, and regenerative turbine to pressurize the gas and the liquid housed in the reactor;

dissolving at least some of the gas into the liquid in the reactor;

transferring the liquid having at least some of the gas dissolved therein from the reactor to the second reservoir via the outlet.

17. The method of claim 16 wherein the second reservoir contains a liquid having a low concentration of dissolved gas such that the method results in preventing the effervescent loss of dissolved gas in the liquid having at least some gas dissolved therein transferred into the second reservoir.

18. The method of claim 17 wherein the gas comprises oxygen, the liquid comprises water, and the liquid contained in the second reservoir contains a low concentration of oxygen such that the method results in dissolving oxygen into the water and in preventing the effervescent loss of dissolved oxygen in the water.